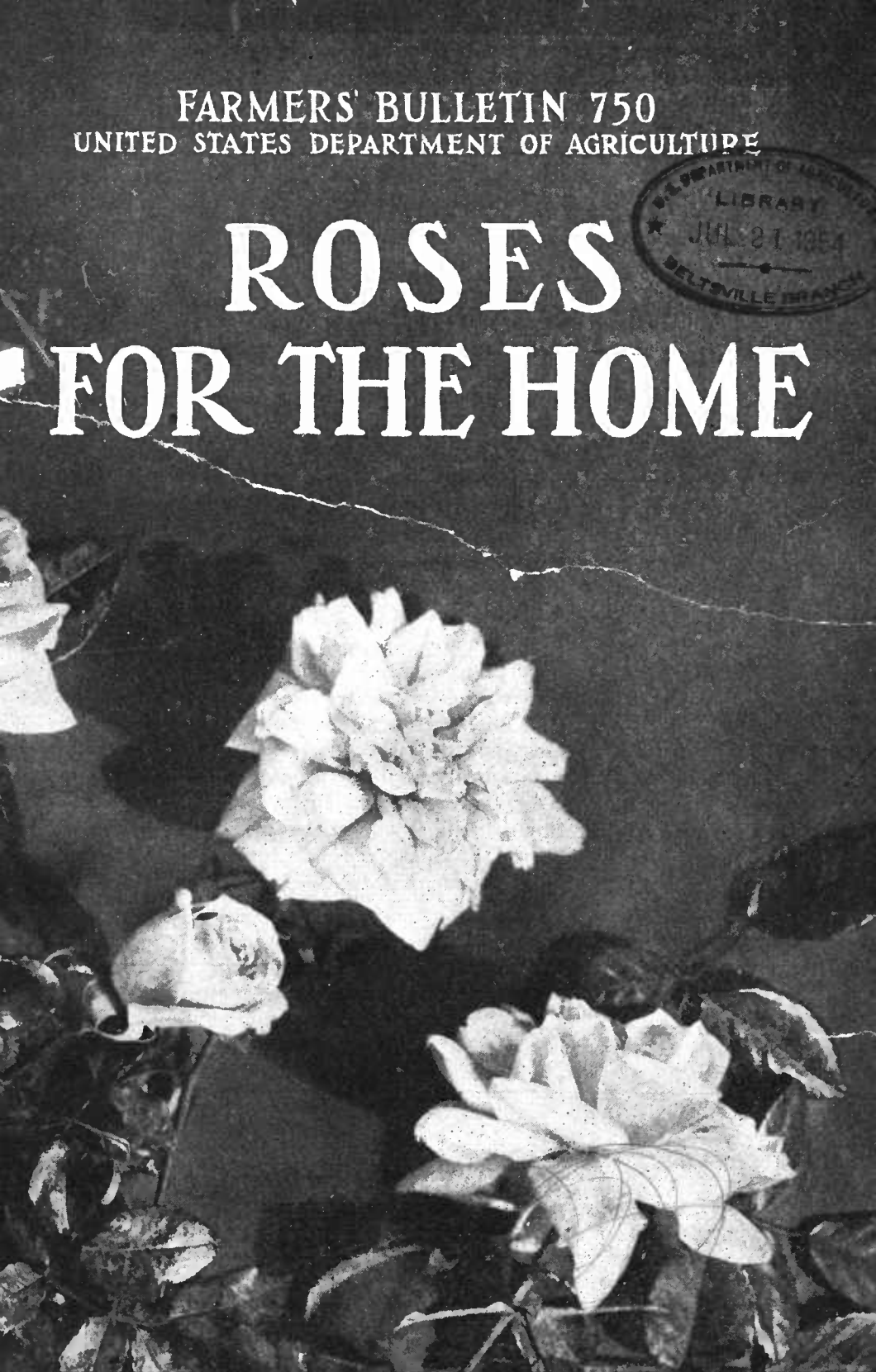
FARMERS' BULLETIN 750
UNITED STATES DEPARTMENT OF AGRICULTURE

ROSES FOR THE HOME



ROSES.

THE great task of pioneering and bringing the land under the plow has, for the most part, been accomplished. The people of this Nation are no longer content with the attainment of the three primary necessities—food, clothing, and shelter. They demand in addition that the food shall be the product of many climes; that the clothing shall befit their station and work; and that the shelter shall not only provide bodily comforts, but that it shall be surrounded by trees and shrubs, not alone for the shade and protection they offer, but for the pleasure they afford as they express life's great drama in the passing of the seasons.

No decorative plant has been more closely identified with the progress of western civilization than the Rose. It is an insignia alike of joy, of sorrow, of love, and of war. It is the flower beloved by all. Certainly those who contribute in any way to the propagation, development, and culture of the Rose are adding much to the joys and beauties of life.—*Edwin T. Meredith, Secretary of Agriculture, in Greeting to the American Rose Society, in its 1920 Annual.*

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WM. A. TAYLOR, Chief

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ROSES FOR THE HOME.

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INTRODUCTION.

The rose has probably been cultivated as long as any ornamental plant, and it holds a warmer place in the hearts of the people than any other flower. From earliest times it has been a favorite. It has figured in the literature of all ages and all nations. People in all stations of life yield homage to its beauty of form and color and to its delicious fragrance. It is loved by poor and rich alike. It is grown in the dooryards of the least pretentious cottages, where often the occupants are stinted in food and raiment, as well as on the grounds of large estates, where abound the choicest things that money can buy. It is also grown in immense quantities under glass and is the most popular winter cut flower for all occasions. So deep a hold has it on the affections of the people that it is often spoken of as the "queen of flowers."

Wild roses abound in great variety over practically all the temperate regions of the earth. Man has taken advantage of this and

NOTE.—This bulletin is of general interest to those who wish to grow roses for pleasure and for the beautification of their home grounds.

has appropriated the most pleasing wild forms for his use. In addition, he has so modified and improved the wild sorts by breeding and selection that now there is a rose for every need. The present bulletin, however, will be restricted to a consideration of roses for the lawn and border, for the arbor and trellis, for cutting, and for other ornamental purposes.

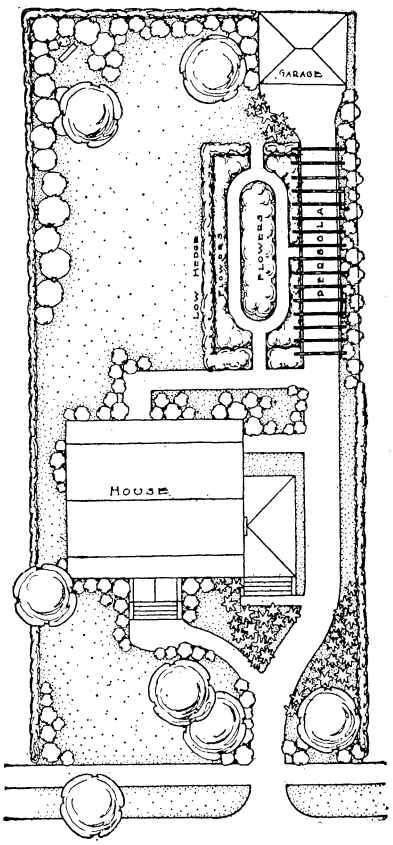

FIG. 1.—Plan for a city lot. Border roses may be used in combination with other shrubs in any of the clumps about the house or on the borders. Cut-flower roses would be appropriate in the garden or in the bed between the garden and the garage.

ROSES FOR THE LAWN AND BORDER.

Roses for the lawn and border are those which, because of their habits of growth and their foliage, are as well suited for use in relief planting about the ground line of buildings or in masses upon the lawn or along borders as other ornamental shrubs. When suitable sorts are chosen, roses are quite as appropriate and effective in mixed groups as are other shrubs. To be suitable for this use, however, they must be hardy, moderately free in growth, and possess foliage reasonably disease resistant and free from insect attack. In fact, for this purpose, foliage is more to be desired than fine flowers. The foliage is a feature during the whole growing season, while the flowers may cover a period less than a fortnight in length.

In figure 1 the groups on the borders of the grounds or about the base of the house might appropriately be partially composed of these hardy roses, while the cut-flower roses should be grown in the garden.

SPECIES AND VARIETIES.

Rugosa rose.—The Rugosa or Wrinkled Japanese rose[1] is one of the deservedly popular sorts for landscape planting. The original form, native to China, Chosen (Korea), and Japan, grows 5 to 6 feet

[1] *Rosa rugosa.*

tall, is rose colored, single, with rough, dark foliage. It blooms nearly all summer, and bears large bright red hips that persist during the winter. This rose is hardy in the North, succeeds well in the South, and thrives within reach of ocean spray. There is a good white form (fig. 2). Hybrids are being introduced that are more or less double and of several colors, from pure white to deep rose. Some of the hybrids are less prolific than the type in the number of hips formed.

Carolina rose.—The Carolina rose[1] is an upright shrub, native from Canada to the Gulf of Mexico and west to the Mississippi River; most common in moist places. It reaches a height of 8 feet,

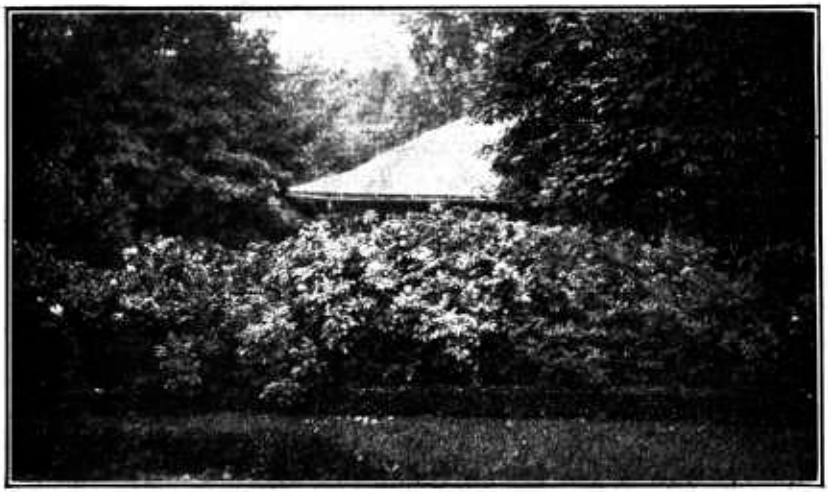

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FIG. 2.—White Rugosa roses blooming in a clump of shrubbery. These roses bloom all summer and the blooms are followed by very attractive hips.

has dull green foliage, small pink flowers in flat-topped clusters, followed by small, bright-colored hips.

Rosa lucida.—The wild rose, native in New England, New York, and Pennsylvania, is a shrub growing 6 feet tall, with dark, shiny leaves. Its single pink flowers are borne singly or in small clusters in June and July. The hips are small, bright red. The stems are brownish red, showy, and attractive. When planted closely, it is especially desirable for a low ground cover 2 to 3 feet high. It effectually deters crosscutting and is good for rough banks and seaside planting or other adverse conditions.

Prairie rose.—The Prairie rose[2] is a shrub 6 feet high, with long, drooping branches that adapt it also for use as a pillar rose. Native

[1] *Rosa carolina.* [2] *Rosa setigera.*

from Canada to Florida and west to Wisconsin, Nebraska, and Texas, it is a hardy species, thriving under adverse conditions. Its flowers are scentless, single, deep rose, in several-flowered clusters, fading to almost white. The hips are bright red, showy, attractive, and persistent.

Arkansas rose.—The Arkansas rose,[1] formerly included with *Rosa blanda*, is a valuable species, native from Minnesota and British Columbia to Mexico. Its flowers are single, pink, sometimes white, in clusters. It is useful for covering dry slopes and barren places. This rose is not widely listed by nurserymen, but it is a valuable sort for the dry regions in the western half of the country and for other dry soils.

Sweetbrier.—The sweetbrier, or eglantine,[2] is an upright, compact shrub from Europe that has run wild in many places. A characteristic spicy, aromatic odor is emitted by the young shoots in damp weather and from the leaves when bruised. The flowers are single, pink, one to three in a cluster; the hip is either orange or scarlet and the foliage is bright and glossy. There are many good crosses, among which are the Penzance hybrids.

Rosa eglanteria or Rosa lutea.—The Austrian Copper, Austrian Yellow, Persian Yellow, and Harrison's Yellow are important and useful varieties in the *Rosa eglanteria* or *Rosa lutea* groups. They are deep yellow, showy, with green or greenish winter stems. The Pernet rose is closely allied to these.

Dwarf Polyantha rose.—The Baby Rambler[3] roses comprise a group which includes a large number of varieties of dwarf habit (1 to 2 feet mostly), of many shades of white, pink, and red, with flowers borne freely in clusters throughout the season. They are very useful for low bedding.

Cabbage rose.—The Cabbage rose[4] is a shrub attaining a height of 5 feet which has only one blooming season, but that a long one. The flowers are double, either red or white. The variegated Provence rose is closely related. There are also cultivated forms with mossy calyxes, some with red flowers and some with white. There are other moss roses derived from hybrid perpetuals which are not adapted to the same uses as Cabbage roses.

Damask rose.—The Damask rose[5] is a round, compact, 5-foot shrub that holds its foliage late and bears two crops of red flowers.

Additional species.—In addition to the foregoing, and perhaps equally desirable, long lists of valuable species are offered by nurserymen, and many more are not yet in the trade. Among the latter, *Rosa hugonis* and *Rosa sericea* are very promising.

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[1] *Rosa arkansana.*
[2] *Rosa rubiginosa.*
[3] *Rosa polyantha.*
[4] *Rosa gallica centifolia.*
[5] *Rosa damascena.*

SOIL AND FERTILIZER.

The roses included in the foregoing descriptions are adapted to a wide range of soil conditions and may be counted on to succeed in any but extremely heavy or very sandy soils, and many of them will do well even on these types of soil. Thorough drainage and a plentiful supply of organic matter, with a reasonably constant water supply during the growing season, are essential. A soil capable of growing good garden or field crops is suitable for roses. The deeper the soil and the better the preparation at the beginning the more satisfactory will be the results.

Rotted cow manure is the best fertilizer. Any other well-rotted manure or good compost will serve the purpose. Fresh manure, especially horse manure, is to be avoided. If no other manure is available it may be used, but it must neither come in direct contact with the roots when planting, nor should it be used immediately beneath the plant in quantity sufficient to cut off direct connection with the subsoil and the water supply. Of the commercial fertilizers, ground bone is excellent to add as additional food, but will not answer as a substitute for plenty of compost. Where it is cheap enough, cottonseed meal may be used as a substitute for bone. Wood ashes are sometimes a helpful addition, or, when they are not available, lime and muriate of potash, applied separately, may be used. Sandy soils need more frequent applications of manure than heavier soils, as the organic matter burns out more rapidly in them and must therefore be replenished more liberally.

PLANTING.

The distance apart to plant will depend on the variety and also on the other plants used. The rose plants should be so spaced that when they reach maturity they will come together without overcrowding. Those of the Rugosa and the Austrian Copper groups should be planted 3 feet apart, the Baby Ramblers 2 feet, and the hybrid Rugosas and other kinds 4, 5, or 6 feet, depending on the vigor of growth of the variety.

Those varieties most used in landscape planting are usually priced by nurserymen according to size rather than age, that is, according to height and, to a certain extent, according to stockiness or weight. A short, stocky, or heavy plant is better than a taller light one.

The roses used as a substitute for other shrubbery are so hardy that they should be treated as other shrubs in their respective localities. In the extreme northern part of the United States and on the western Plains where there are strong drying winds in winter, early spring planting is best. In the other regions fall planting has advantages over spring planting, but not sufficient to warrant postponing spring

planting until autumn, although enough to push planting in the fall rather than to wait until spring. These different areas are indicated on the map shown in figure 3. There are localities north of the line suggested as the division between successful fall and spring transplanting where fall planting can safely and satisfactorily be done, and others south of it where spring planting is more desirable. Spring planting should be done as soon as the ground is dry enough to work, or when it springs apart after being squeezed in the hand. Fall planting is best done as soon as the leaves have fallen from trees and bushes.

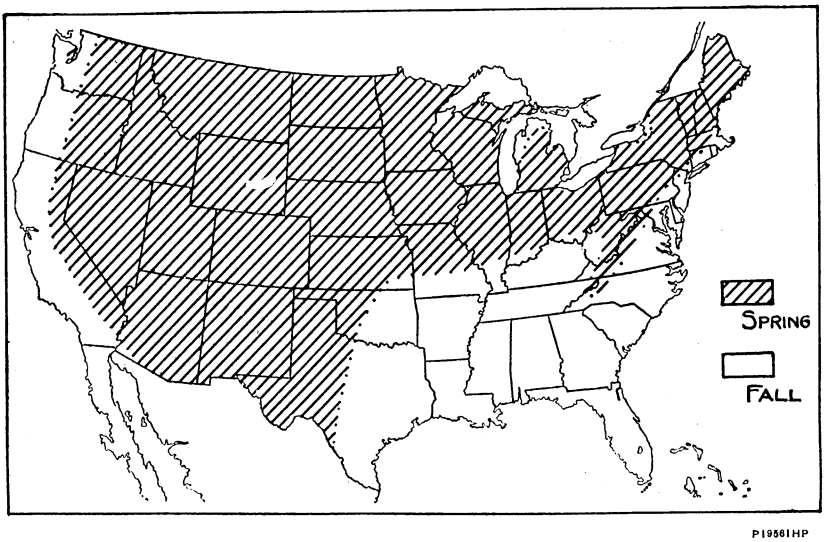

FIG. 3.—Outline map of the United States, showing the areas in which fall transplantings and spring transplantings of roses are usually most satisfactory.

Stock should be planted as soon as possible after it arrives. Sometimes it is impossible to do this immediately. In that case the plants should be unpacked and heeled in, that is, a trench should be dug, the roots laid in, and all brought in contact with the soil. With dormant plants it is usual to lay the tops close to the ground in this operation, though it is not essential. If the plant roots are dry when received, soaking them in water an hour or more before heeling in is desirable. If the stems are shriveled, burying the whole plant for a few days may restore plumpness and insure their growing. If the plants are frozen when received, they should be placed where they will thaw gradually, but they should not be unpacked until the frost is out beyond all question.

When ready to set, the plants should be taken to the permanent location, with the roots thoroughly covered, no matter how short the distance. More plants are killed by the undue exposure of roots at

planting time than from any other cause. The roots may be placed in a bucket of water while removing to the planting ground and until planted, or they may be puddled in a mixture of thin clay and then be kept covered with wet burlap or other protection until planted, making sure the clay does not become dry before planting. They should be planted a little deeper than they were before. If planted too shallow the roots will probably be exposed, which means they would dry at the exposed part and thus prevent the passage of sap from the covered tips of the roots to the branches, or from lack of a firm anchorage winds would easily sway the plant, thereby loosening it in the soil, allowing the roots to dry and die. If planted too deep the bark of the buried stems would be injured, and growth

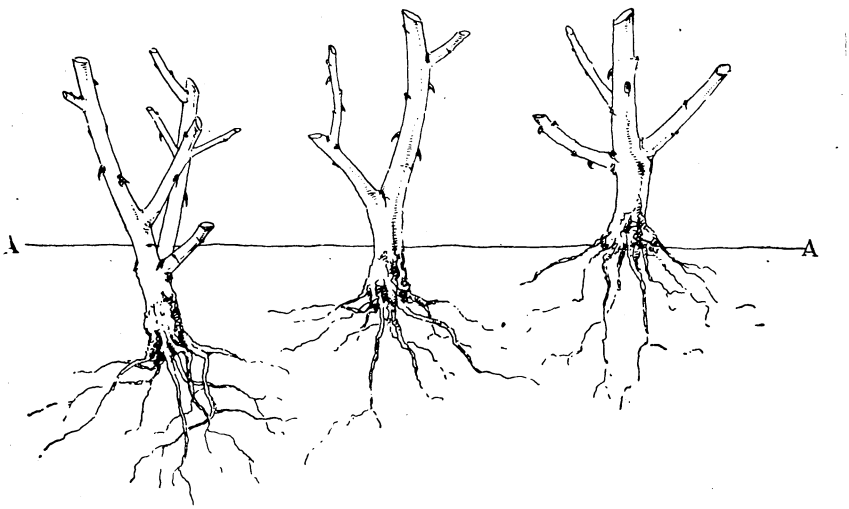

FIG. 4.—Sketches of rose bushes showing proper and improper depths of planting. The line *A*—*A* indicates the surface of the soil.

would be checked until new roots formed nearer the surface. The proper depth for planting is shown in figure 4.

In planting dormant bushes it is desirable to trim the ends of broken roots and any that are too long just before they are put into the hole, so that there will be good, smooth, fresh surfaces which can callus and heal over. It is usual to have this fresh-cut surface on the under side of the root. The hole in which the bush is to be planted should be several inches larger across than the roots will extend and ample in depth, with a little loose earth on the bottom. The roots should be separated well in all directions, with the soil well worked in among them, separating them into layers, each of which should be spread out like the fingers of the hand. When the hole is partially full, the plant should be shaken up and down so as to make sure it is in close contact with the soil under the crown where

the roots branch. When the roots are well covered the soil should be firmed. This is best done by tramping. If the soil is in proper condition tramping can not injure the plants. This will leave a depression about them, but all the roots will be covered.

When all are planted, each one may be watered, although this is not usually necessary, especially if the roots have been puddled before planting. If water is applied, permit it to soak in about the roots and then fill the hole with dry earth without more tramping. With the soil wet from the watering it would be injurious to compact it more. If not watered the depression should be filled with loose earth the same as though it had been watered. After planting no watering should be done unless very dry weather follows, and even then care must be exercised not to overdo it till after growth starts. In watering, it is desirable to draw away some earth from about the bush, apply the water, and after it has soaked in draw dry earth about the plant again.

PRUNING.

Roses used as shrubs should be planted far enough apart to reach maturity without crowding. At the time of planting, one-half to two-thirds of the wood should be removed. Weak branches should be taken off, and long canes that would be liable to whip around and loosen the plant should be cut back. As far as practicable, pruning other than this should be accomplished by cutting out whole branches rather than by cutting off the ends. After the first year, pruning should consist of removing dead, dying, or weak wood, and crossing branches, including any that may be found with discolored pith. Cutting off the ends of branches should be avoided. Most of the roses suggested for border planting are improved by having the whole top cut off every 5 or 6 years. All pruning of these roses should be done in the spring, as summer or fall pruning would remove the hips prematurely and thus rob the plants of much of their attractiveness during the winter.

Only under extremely trying conditions do these roses need winter protection. If the autumn has been a dry one in the dry Plains region a good mulching after a thorough soaking of the soil should be given the first winter.

ROSES FOR THE ARBOR AND TRELLIS.

The climbing roses, used for covering pillars (fig. 5), porches, arbors, pergolas, summerhouses, terraces, walls, and fences will next be considered. Those which do not grow over 6 or 8 feet high are spoken of as pillar roses, while the more vigorous ones are called

climbers, or ramblers, depending somewhat on their parentage. With a few exceptions, these roses have but one period of bloom, which lasts a week, or at most two weeks. The foliage must be depended upon for any ornamental effect during the remainder of the season; therefore, in those locations where an attractive appearance is desirable every day the first consideration is a rose with healthy, vigorous foliage not subject to disease and insect attacks. A healthy rose is especially attractive on or close to a house. Where shade is desired throughout the summer other climbers are often preferable to roses, as explained under the head of "Pruning" (p. 11.)

P14719HP

FIG. 5.—A young climbing rose (Clothilde Soupert).

VARIETIES.

The varieties of climbing roses belong to several groups, with many intermediate kinds.

The Multiflora roses, usually spoken of as hardy climbers, are reasonably hardy in the North and are vigorous growers. They flower in clusters. Many of them are subject to mildew and insect attack. This is especially true of the so-called ramblers.

The Wichuraiana, or Memorial rose, has small, dark, glossy, almost evergreen foliage, which is resistant to disease and insects. Its blossoms are single, white, followed by bright hips. Many hybrids of this rose have been introduced, most of which retain the good foliage characteristic of the parent, while varying greatly in their blossoms. Bright hips, which persist through the winter, follow the blossoms on the single varieties.

The climbing teas are pillar roses and retain some of the tea habits, blooming more or less continuously throughout the season.

Roses of the climbing Noisette group, represented by Marechal Niel, Lamarque, and other varieties, are suitable for culture only in the warmer sections where the winter temperature seldom falls to 10° F. above zero.

Roses of the Laevigata group, represented by the Cherokee, require as warm a climate as the Noisette roses.

SOIL AND PLANTING.

In planting climbing roses a good-sized hole should be dug and filled with good garden soil mixed with rotted manure. The body of good soil available for a climbing rose should be equal to a hole 3 feet square and 30 inches deep. The drainage must be good, as roses will not thrive where water stands about their roots.

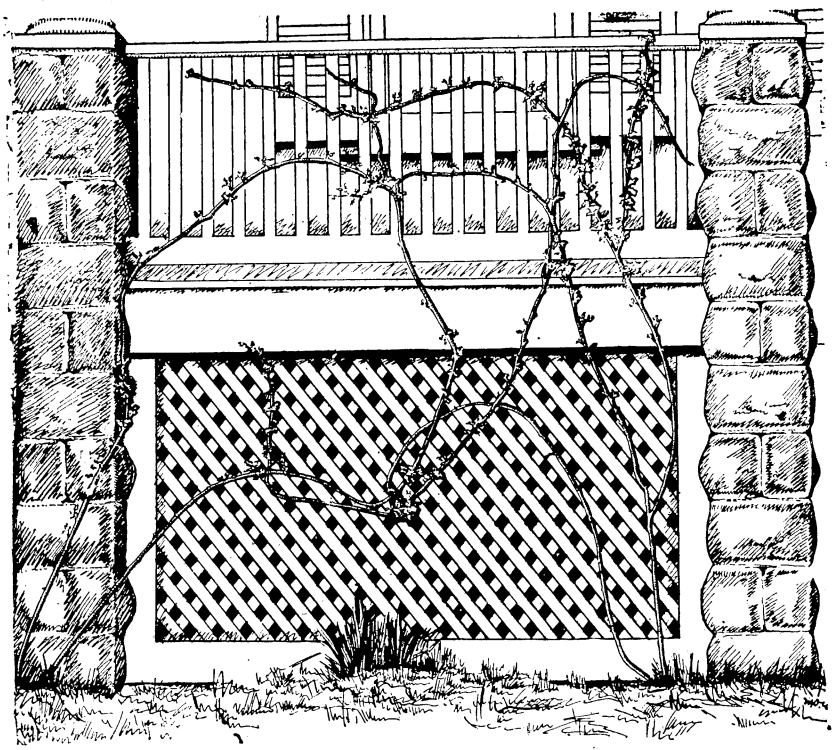

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FIG. 6.—Climbing (Dorothy Perkins) roses after the spring pruning.

The planting must be done carefully, as already stated. One-half of the wood should be pruned off at planting time.

PRUNING.

The Wichuraiana and hardy climbing roses should be pruned just after blooming. At this time young shoots will have started from the roots. The growth of these shoots should be encouraged, as it is from them that most of the branches are produced that bear the following year's bloom. The best way is to remove all the old wood

at this time, so that all the strength will go into the young shoots. Where the roses are trained over a trellis so high that one season's growth will not cover it, the method just described is not practicable. In such cases some of the old shoots should be cut off at the ground, and the others should be shortened from 3 to 6 feet, depending on the amount of growth the vine has been making each year. New shoots should be trained to take the place of those removed. It should be kept constantly in mind that the present year's growth bears next year's flowering branches and that a few vigorous branches are more desirable than many weak ones.

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FIG. 7.—Dorothy Perkins roses in bloom. The left-hand panel shows the same bushes illustrated in figure 6 as they appeared later.

In the spring any weak branches may be removed, and the ends of some of the others may be shortened, but comparatively little should be taken off. Figure 6 shows climbing roses after the spring pruning. The left-hand panel of figure 7 shows the same roses in bloom, while figure 8 shows the same plants 6 weeks after blooming, all the wood shown in figure 6 having been cut away as soon as the blooms faded. The wood seen in figure 8 is of the current season's growth. Most of the blooms on the Multiflora and Wichuraiana roses and their hybrids will be on the shoots from the last year's wood, and every bud removed reduces the number of blooms. This method of pruning removes most of the foliage just after blooming and leaves the trellises without covering during the hottest part of the summer.

Roses of the hybrid Noisette group, of which the Marechal Niel is a representative, should be trained to a good strong cane, with the side shoots cut back to about three eyes. The main cane can be renewed occasionally.

The Cherokee rose should be treated like the border roses, pruning only dying or crossing branches. Every few years it may be cut back severely and allowed to start again.

Roses are not climbing plants in the same sense as grapevines or morning-glories. They have no tendrils and do not support themselves by twining. For this reason it is necessary to train and tie the canes as they grow.

P16699HP

FIG. 8.—The same roses shown in figures 6 and 7 after the blooming season. All the bent stems seen in figure 6 and all the flowering wood seen in figure 7 have been removed, and what is shown here is the young growth made the current season.

PROTECTION.

In the northern sections, where roses are apt to winterkill, it is necessary to protect climbing roses in some way. Wrapping the bushes in straw is effective where the cold is not too great, but is somewhat unsightly. It permits keeping the vines more nearly in their summer position. A surer method is to lay the vines down, covering them with earth, and after that is frozen adding a layer of straw or manure. This covering must be removed promptly in the spring as soon as freezing is over.

ROSES FOR CUTTING.

Roses for cut flowers require special attention and care to be successful. Their appropriate place is in the flower garden or in a secluded bed of their own, as shown in figure 9. They need more

room and more cultivation than plants adapted to border planting. For ease of cultivation, for accessibility in gathering blooms, and for effectiveness in treating insect and fungous attacks, it is desirable that these roses be grouped in beds specially arranged for them. Like other flowers designed primarily for cutting, they have an important place on the home lot, but that place is in a special garden

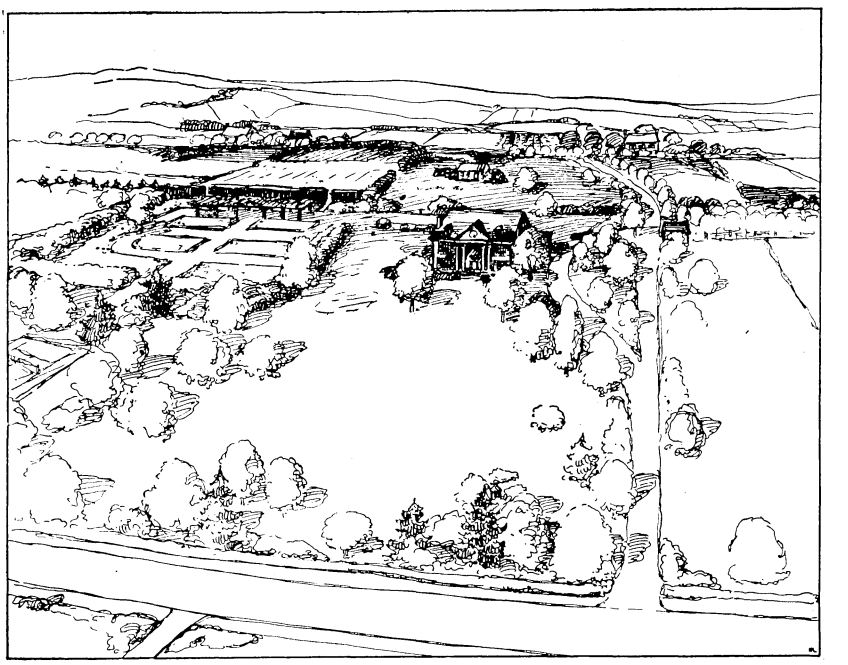

FIG. 9.—Farm home grounds, typical of suburban homes. Border roses would be appropriate with other shrubs in any of the clumps indicated, either near the house or along the borders of the lawns. Cut-flower roses would be appropriate either in the flower garden or in the cut-flower garden.

or in a subordinate place in the general planting scheme, and they should not be used for lawn planting.

VARIETIES.

Hybrid perpetuals, hybrid teas, teas, Bengals, Bourbons, and Chinas are the roses available for cut flowers. There is a multitude of varieties, so that everyone should be able to find some to his liking.

The hybrid perpetual roses (fig. 10) usually bloom only in the early summer, but sometimes bloom a second time if thoroughly pruned, especially if given a midsummer check by dry weather. They are the hardiest of the cut-flower roses and are the only ones to

be relied upon in the colder parts of the country and in the rural districts of the dry-land region. The map (fig. 11) indicates the region where these roses are the most useful. In the warmer sections with plenty of moisture the hybrid teas are more desirable.

The hybrid tea roses (fig. 12), when properly treated, bloom from spring until cold weather. Many of the varieties succeed north of the area marked for them. They will succeed on the southern portions of the Great Plains if they can be irrigated, but are not adapted to the sections of that region where irrigation is not available.

Tea roses are tenderer than hybrid teas. Although some of them are weak growers, they are most attractive. One writer describes them as "the spoiled child of the rose family." The tea roses succeed well in the South Atlantic and Gulf States and on the Pacific

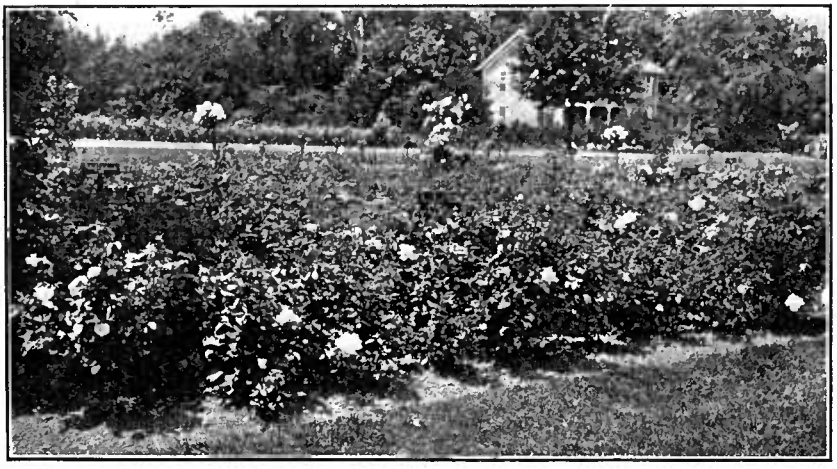

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FIG. 10.—A bed of hybrid perpetual roses (Frau Karl Druschki).

coast. These and the hybrid teas provide the most satisfactory roses in the regions where they succeed.

The China or Bengal rose is one of the forms from which a great many of the garden roses have been developed. But few of these varieties are now offered by nurserymen.

The Bourbon rose is best known through the variety Souvenir de la Malmaison, which in hardiness compares favorably with the hybrid teas. There are other varieties.

The selection of varieties is best made after consultation with near-by growers or nurserymen who are most familiar with local conditions. The larger rose-growing firms are also in a position to make reasonably safe suggestions for any region if given full information as to location, exposure, kind of soil, and other local factors.

THE KIND OF STOCK TO PLANT.

Nurserymen speak of roses as "own root," "budded," or "grafted." By own-root roses they usually mean a rose that has been grown from a cutting, though roses grown from seed are as truly own-root roses as those grown from cuttings. As opposed to own-root roses there are budded or grafted roses, which means that a single-leaf bud or a stick with one or more buds of one kind has been made to grow on the roots of another kind. The plant that provides the roots is called the stock, and the one that provides the top, whether bud

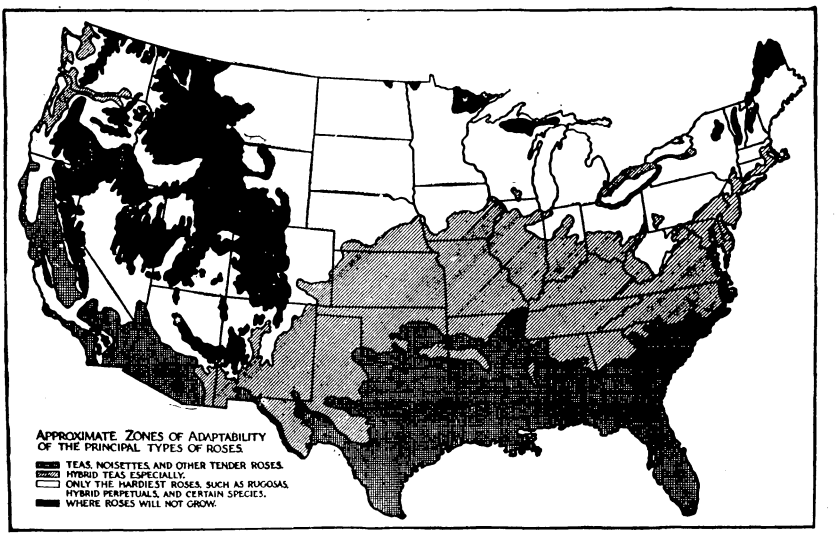

FIG. 11.—Outline map of the United States, showing the classes of roses best adapted for cut-flower purposes in the different sections.

or graft, is called the scion. In nature, roses are propagated mostly from seed, and many of the cultivated rose species may be freely grown in that way. In the less improved species all the plants will be very much alike. In the more improved species the variations may be very marked. An improved species in this sense is one which has been cultivated for generations, and even centuries, from the seedlings of which man has selected those that have most appealed to him. In many cases those selected have been the result of crosses with other species. These extreme and unusual types will not propagate true from seed, and must, therefore, be propagated from cut-

tings or by buds or grafts. In each case some wood from the old plant is taken to make the new one. When wood is plenty and the rose grows vigorously, cuttage is the natural method to use. When wood is scarce, or the variety is a weak grower, or has a poor root system, or its own roots are not adapted to the soil on which it is to be grown, budding or grafting is used. Budding takes the least wood and is so satisfactory that it is most used.

P14995HP

FIG. 12.—A hybrid tea rose (White Maman Cochet).

For the roots or stocks on which to graft or bud other roses an easily propagated strong-growing variety is needed. It must be easily propagated to provide a large number of plants cheaply. It must be a vigorous grower in order to provide ample nourishment for the new top. On the other hand, it must not be so vigorous as to have an excessive tendency to push out suckers below the graft or bud and thus rob the adopted top of its proper nourishment.

The advantage of grafted and budded roses is that they are more vigorous the first few years, but they have to be watched closely to prevent shoots starting from the stock, as such shoots take the sap and thus starve the scion. The expert who can constantly watch his plants may be successful with grafted and budded roses, but the aver-

age grower would do best to use own-rooted plants, even though they do not grow so fast. The few varieties that succeed only when grafted should not be tried until the grower has become expert in handling roses. Climbing roses are grafted less often than hybrid perpetuals, hybrid teas, and teas.

Plants are propagated under glass and in the field. The field-grown plants are usually rather more robust and more likely to withstand adverse conditions. The older pot-grown plants offered by nurserymen are frequently field-grown plants potted and forced for spring sales. Such plants, if well handled, are as good as the unforced stock where potted material is needed. This is very different material from that grown almost exclusively under glass. The pot-grown plants are desirable whenever spring planting must be delayed beyond the usual planting season. For fall planting and for early spring before corn-planting time dormant field-grown plants should be used.

The size or age of the plant to use is largely a matter of choice. They are offered in various sizes, from 1 to 3 years. These ages are reckoned from the time when the cutting was made or the time when the budding or grafting was done. The plants from cuttings are smaller than the other plants of the same age and variety. Three-year-old plants give the quickest results. Two-year-old plants can be transplanted more successfully than older ones and are rather more satisfactory. One-year-old plants have to be grown for a year before any real results are obtained in the way of bloom. The first year the flower buds should be picked from this small size as soon as formed, to let all the strength go into growth.

SOIL AND DRAINAGE.

Cut-flower roses thrive in a well-drained soil that is not too dry and is well supplied with organic matter. The hybrid perpetuals succeed best in clay loam or in a soil with a clay subsoil. They do not succeed so well in gravel soils. Many of the tea roses and their hybrids succeed in very light lands if well supplied with organic matter and water, although the ideal soil is a loamy one. A well-enriched soil and one reasonably constant in its ability to supply the plant with moisture is the chief requirement. On the other hand, it must be well drained, as roses will not grow when water stands about their roots. In heavy clay soils or wherever water is liable to stand, it is desirable to provide artificial drainage. This is best done by excavating to a depth of 3 feet, placing a 12-inch layer of stones in the bottom, covering these with inverted sods, and then refilling the bed with well-prepared soil (fig. 13). This layer of drainage should

be connected with some proper outlet for carrying off the water. A drain of a similar layer of stones 1 foot or more wide, or a tile, should lead to some main drain, a sewer, or to an opening on lower land, so that surplus water will be carried away immediately. In well-drained soils such special precaution is not necessary. Sometimes the layer of stones without the outlet drain will be sufficient.

The recommendations already made about manures and fertilizers are equally applicable to cut-flower roses. The use of rotted cow manure or well-prepared compost is even more important for cut-flower roses than for border roses.

PLANTING.

The time of planting cut-flower roses varies with the kind of plants, the location, and somewhat with the season. These roses are supplied by dealers either as dormant or as potted plants. Through those sections where the temperature does not fall below 10° F., where the winter winds are not exceptionally drying, and where the soil has been so prepared that it does not heave badly, dormant roses are best planted in the fall. In other places spring planting is best. Directions for planting dormant roses are given under "Roses for the lawn and border." If budded or grafted roses are used they must be planted deeper than own-root roses would be, as shown in figure 14. Because of the liability of shoots starting from the stock below the scion, the point of union between the stock and scion should be planted 3 inches under ground. By planting in this way the scion will have an opportunity to form roots from the part of the stem in the ground and thus become at least partially own rooted. Planting the stock so deeply discourages the formation of new shoots from it. If any appear they must be removed at once.

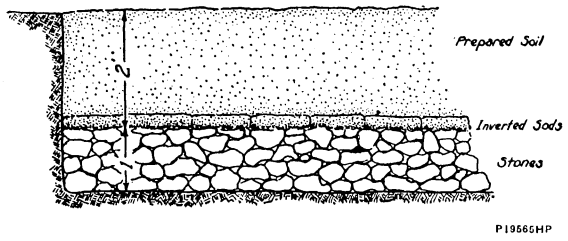

FIG. 13.—Cross section of a well-prepared rose bed.

Potted plants should be set out only in the spring after the maples come into leaf, or not over two weeks before the oaks come into leaf. With potted plants, no root pruning is necessary, as any pruning required should be done at the time of potting. Where the roses are small and suited to the size of the pot, the balls of earth are planted with the top half an inch or so below the surface. The soil is compacted about the ball without breaking it. These roses are watered in the same way as dormant plants.

Field-grown plants, especially the larger sizes, usually have long roots. When placed in a pot of a practicable size these roots are doubled up. In planting them in the garden the roots should be straightened out. One advantage of pot-grown plants is to have plants whose roots are in close contact with the soil, so they will continue their growth without interruption. To disturb the ball of soil in straightening the roots is liable to break this contact. By having the ball of earth quite wet, its breakage does not cause the complete dropping away of the soil when it is disturbed for the purpose of spreading the roots. Good earth must be well compacted about these soil-covered roots, and the whole should be watered and dry soil put about the plants after the water has soaked away.

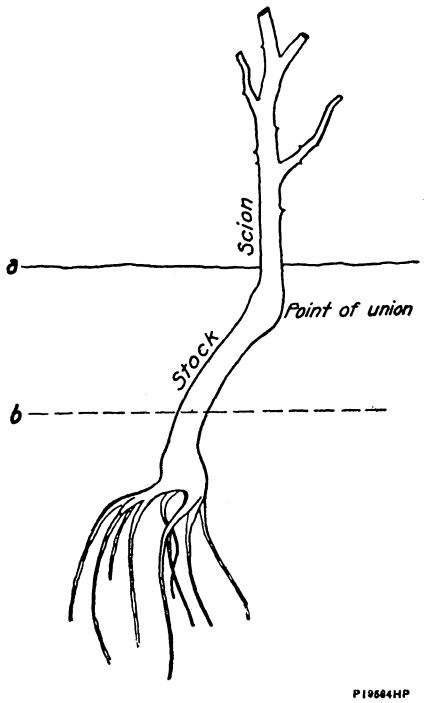

FIG. 14.—Proper depths for planting roses: *a*, Proper soil level for a grafted or budded rose; *b*, proper soil level if the plant were on its own roots.

Hybrid perpetual roses should be set from 2 to 3 feet apart, depending on the vigor of growth and the locality. In the regions indicated on the map (fig. 11) as having to depend mostly on these roses for cut flowers, 30 inches is probably far enough apart when they are pruned for individual blossoms. When the greatest mass of bloom is wanted the vigorous ones had better be 3 feet apart. When used in the South they should be slightly farther apart, but because most of them bloom only once during the season, or at most only in the spring and fall, they are neglected there in favor of kinds more desirable for the region.

Tea roses should be planted from 18 to 30 inches apart, depending on the vigor of growth and proposed treatment, 18 to 24 inches probably being about right for cut flowers.

The hybrid tea roses have a greater range of character of growth even than the other kinds discussed, and the proper distance for planting corresponds. The planting distance is from 20 inches to 3 feet, being greatest in the warmer regions where they get an abundance of water and least where they are retarded in growth by cold winters or dry summers.

The China and Bourbon roses should be planted about as far apart as the hybrid perpetuals.

CULTIVATION.

Cut-flower roses should have the ground entirely to themselves. They should not be planted among other plants nor have other plants between them, not even pansies or other low-growing herbs. They need clean cultivation throughout the season every year. If room permits and a large number of roses are being grown, they can be more economically handled by being planted in rows sufficiently far apart for horse cultivation. Cultivation should begin early and continue till within six weeks of the dormant season.

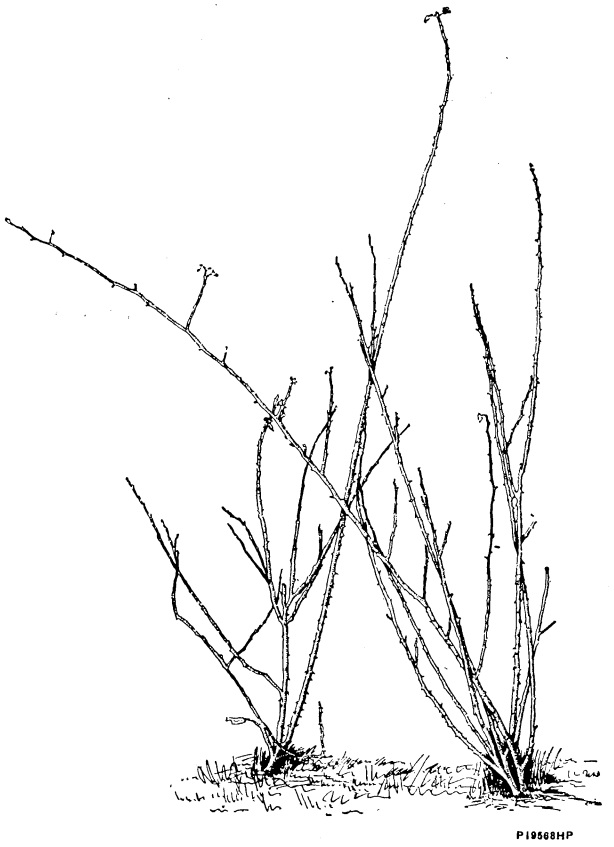

FIG. 15.—Unpruned hybrid perpetual roses: Gloire de la Exposition Bruxelles (at right) and Frau Karl Druschki (at left).

At the first cultivation in spring the manure of the winter mulch should be worked into the soil, or a good coating of manure should be specially applied if there is no mulch. The first working should be deep, to incorporate the manure with the soil. The later cultivations should be just deep enough to maintain a surface mulch.

PRUNING.

For the production of individual blossoms of greatest perfection, as well as to secure a succession of bloom, severe pruning must be practiced. When a large number of blooms of small size is the aim,

the pruning is less severe. Where the greatest amount of bloom is desired, without regard to the size or quality of the individual flowers, the least pruning is done. When dormant cut-flower roses are set in the fall one-half or more of the wood should be removed, as directed for planting the species used for ornamental groups. In the spring these roses should be cut back more, leaving only two or three stems with four or five eyes on each. This will leave them 6 inches or less in length. When dormant roses are planted in the spring they should be pruned at the time of planting, leaving four or five eyes on a stem, as above recommended. In regions where there is no danger of injury from frost or dry winds, the final pruning, as described for spring, may be made in the fall.

After the first year, pruning should be done as soon as freezing weather is over. In regions where roses never suffer from cold it may be done in the fall. All weak wood and crossing branches should be removed every year. For fine specimen blooms on hybrid perpetuals the remaining shoots should be shortened to four or five eyes. Figure 15 shows unpruned hybrid perpetuals and figure 16 the same bushes pruned for individual blooms. For the greatest mass of bloom only one-third to one-half the length of the shoots should be cut away.

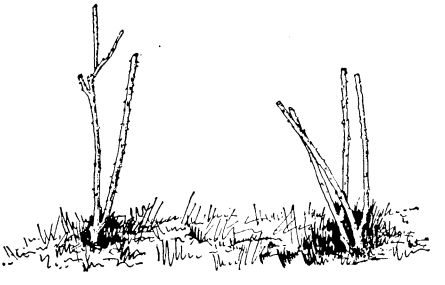

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FIG. 16.—Hybrid perpetual roses pruned for individual blooms. These are the same bushes that are shown in figure 15.

In regions where cold sometimes injures roses, teas and their hybrids should be trimmed later than the other classes, or about the time growth starts. They should be trimmed in the same manner as the hybrid perpetuals, but because of their usually more delicate growth they will look much smaller when the work is done. The strongest growing roses should not be cut as short as the weaker ones. When overpruned the tendency of the plants is to growth rather than to bloom, and a few varieties will not stand the extremely close pruning described. When pruned for specimen blooms the teas and hybrid teas will be only 6 inches to 1 foot high. Figure 17 shows an unpruned hybrid tea, while figure 18 shows the same bush pruned for individual blooms. China, Bengal, and moss roses should be treated the same as the teas and hybrid teas, except that it is not desirable to cut them quite so closely. Bourbon roses should have only half the length of the shoots removed. Summer pruning is desirable.

When a flower is cut from a tea rose or other perpetual bloomer, only two or three strong eyes of the current season's growth of that branch should be left on the plant. This should give the roses very long stems. Figure 19 is the same plant shown in figure 18 as it appeared the next June. Two flowers were cut from this bush three days before the picture was taken. The remaining flowers should be cut close to the ground, where the foliage hides the stems. It will seem like destroying the bush to take so much off, but if the object is the production of roses, the cutting away of the surplus wood will attain the desired end. If the spring pruning has not been sufficiently severe, the plant is liable to have the characteristics shown in figure 20, long, naked stalks and short stems to the flowers. With this character of growth only one or two strong leaf buds should be left on the branch when the flower is cut, so as to stimulate as much growth as possible from the base of the plant.

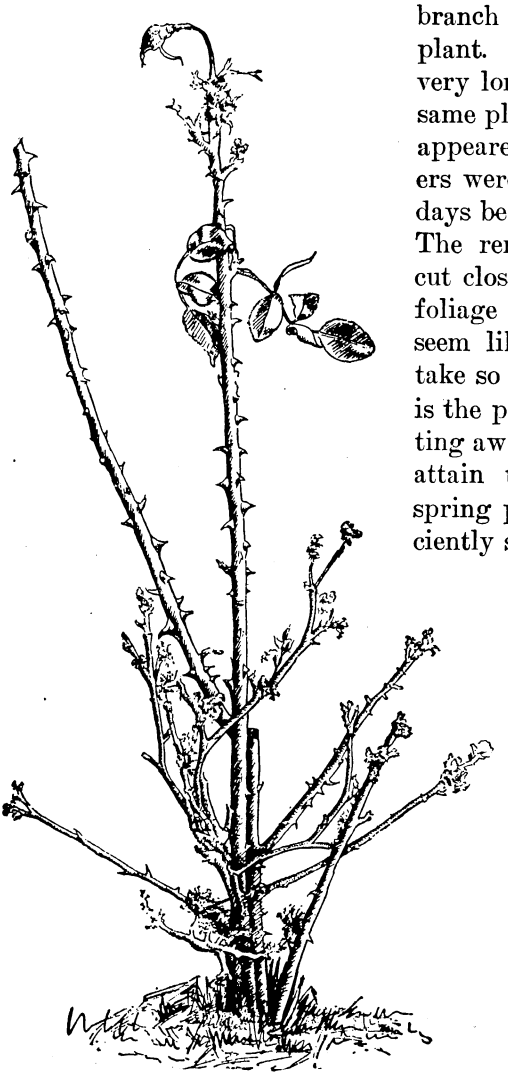

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FIG. 17.—Hybrid tea rose (Radiance) before pruning.

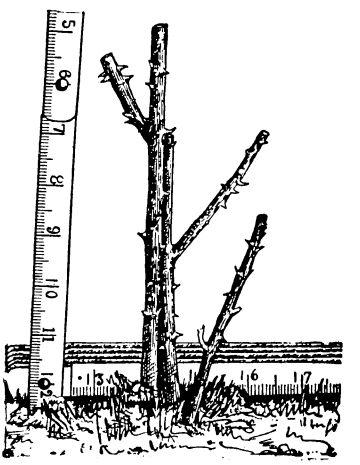

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FIG. 18.—A hybrid tea rose (Radiance) after pruning for individual blooms. This is the same bush that is shown in figure 17. It would be better to cut the left-hand shoot even shorter.

The greatest temptation to leave wood is where there are two or more buds on one branch, some being small when the terminal one is open. This temptation to follow a bad practice can be avoided by pinching off all side shoots after a bud has formed on the end of a branch. This prevents the formation of two or more buds on one stalk. This summer pruning will encourage additional blooms on varieties which bloom more than once a year.

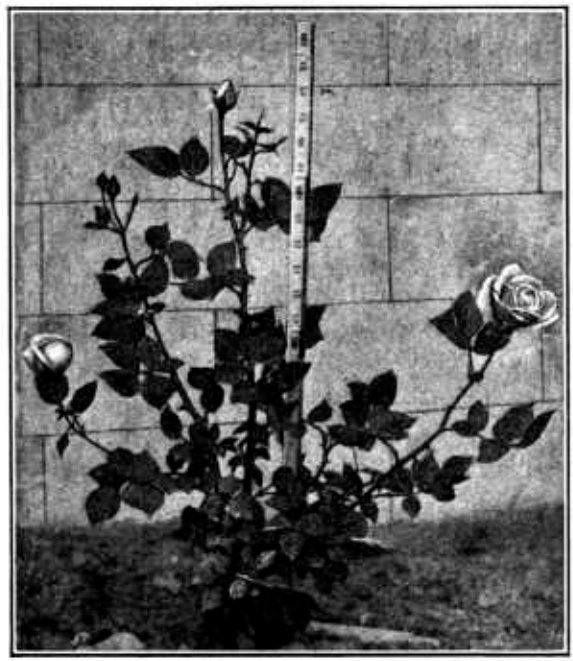

FIG. 19.—The same rose that is shown in figures 17 and 18, at blooming time. Two blooms were cut from this bush three days before this picture was taken. The remaining blooms should be cut under the foliage where the stems are hidden.

Where winter protection is necessary, it is desirable to cut back the tops in the fall to within 30 inches of the ground to allow of more easily covering the bushes. This should be followed in the spring by the regular pruning. The long stems left in this fall pruning help hold the winter mulch from blowing away and from packing too closely. They are also long enough to allow considerable winterkilling and yet have sufficient eyes left to insure ample growth for the next season's bloom.

PROTECTION.

The cut-flower roses need winter protection in the northern half of the country. This may be provided by coarse manure, straw, or leaves applied after the preparatory pruning already described. Evergreen boughs, or even branches from deciduous plants, are often helpful in holding the other materials in place, besides being a protection in themselves. Individual specimens are often wrapped in straw or straw and burlap. There is some danger of trouble from mice in the use of straw and strawy manure, especially during hard winters. This is minimized by banking earth about the plants before mulching.

This banking of earth is also a most effective prevention of injury from cold. Earth banked up about the plants to a height of a foot or more makes an excellent protection, especially if covered well with manure after the ground first freezes. The earth cover must be promptly removed in early spring, as soon as danger from freezing is past.

P18232HP

FIG. 20.—A hybrid tea rose (Killarney) on which the stems were left too long in pruning.

These roses thrive best when not exposed to strong winds. For that reason it is desirable that they be protected. Shrubbery borders, evergreen plantations, and sometimes even fences covered by roses or other vines will make a satisfactory windbreak.

SPECIAL CARE.

Where roses have but a short winter check, due to mild weather, and are grown under irrigation a part of the year, it is conducive to better results to check their growth in the dry season for a month or six weeks by drying them and forcing them to rest.

Where growth is not satisfactory and some plants do not seem to take hold as well as others, the application of a diluted liquid manure often stimulates and starts a plant to growing well.

ROSES FOR OTHER ORNAMENTAL PURPOSES.

HEDGES.

Roses are sometimes desired as a hedge, but are not so well adapted to this purpose as many other plants. Climbing roses make an excellent cover for a fence, as shown in figure 21. The brier roses make a good hedge if severely and frequently pruned, but most roses are neither sufficiently compact nor sufficiently branched to make a really

good hedge. The Rugosa rose (fig. 22) makes a handsome summer barrier, but is so poorly branched that even in summer it does not give protection against small animals, and in winter it does not have a hedge-like appearance. It may be found that some of the untried rose species will be valuable for this purpose.

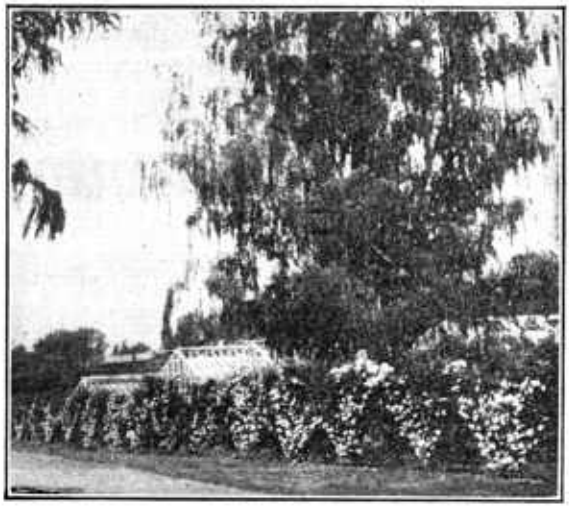

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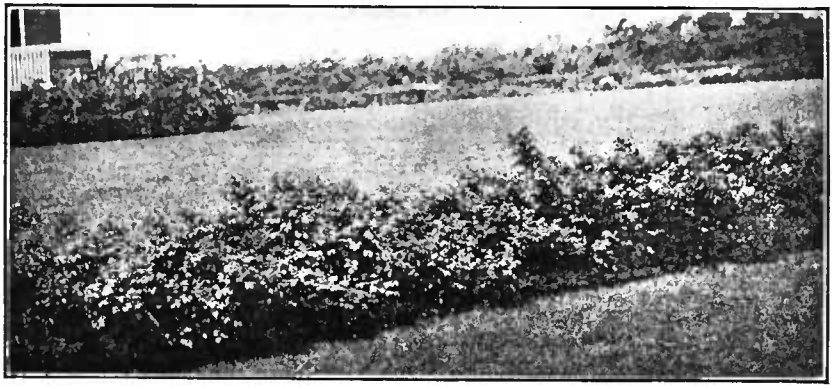
FIG. 21.—A fence covered with climbing roses (Tausendschoen and Philadelphia Rambler in alternation). The most pleasing effect is usually obtained by using a single variety of rose for decoration of this sort.

Hedges need to be closely pruned. This is probably best done twice a year, in the winter or spring and again after flowering time, pruning severely for outline and compactness.

Most so-called rose hedges are rows of cut-flower roses, usually pruned for mass of bloom, with little of the appearance of a hedge except at the height of bloom. Where a few weeks' appearance of barriers is all that is needed, hybrid perpetual



P16746HP

FIG. 22.—A hedge of Rugosa roses.

and hybrid tea roses may be used as well as other species for this purpose.

The hedge should be planted in a trench 3 feet wide and 2 feet deep, filled with soil prepared as for a bed of cut-flower roses.

GROUND COVERS.

As already stated, *Rosa lucida* can be used for covering poor banks with foliage to a depth of 2 or 3 feet, and *Rosa nitida* grows to a height of only 18 inches. The Wichuraiana, already mentioned as a climbing rose, is a trailing rose when given an opportunity and makes a beautiful almost evergreen ground cover (fig. 23), with small, glossy, dark-green leaves. It is useful for banks, as shown in figure 24, the sides of steps, or for hanging over rock cliffs or retaining walls. When permitted to trail it mats closely and roots

P18802HP

FIG. 23.—Wichuraiana roses used as a ground cover in a parking space.

at every joint. Some training but little pruning is needed when it is used in this way.

TREE ROSES.

A tree rose (fig. 25) is a bush rose grafted 3 or more feet above the ground on a long, straight stalk of a brier, Rugosa, or other strong-stemmed rose. These bushes are not very satisfactory in the United States, because the stocks now available do not seem able to stand the hot sun and hot drying winds of the climate of most of this country. In western Oregon and western Washington they

succeed. Their appropriate use is only in connection with a formal design, either in special gardens or near buildings.

CULTURAL PRACTICES.

PROPAGATION.

Roses are propagated from seed, by hardwood cuttings, softwood cuttings, layers, budding, and grafting.

The rose species used as shrubs, such as the Rugosa, Carolina, Prairie, and Wichuraiana, are propagated by root sprouts and the others named by hardwood cuttings. The Wichuraiana is naturally a trailing plant which takes root near any eye. By cutting rooted

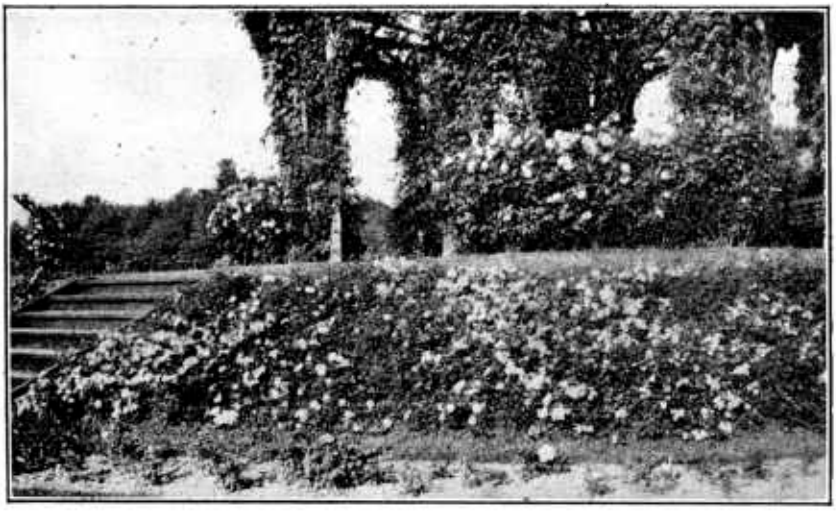


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FIG. 24.—A bank covered by Wichuraiana (Memorial) roses, with Rugosa roses against the summerhouse in the background.

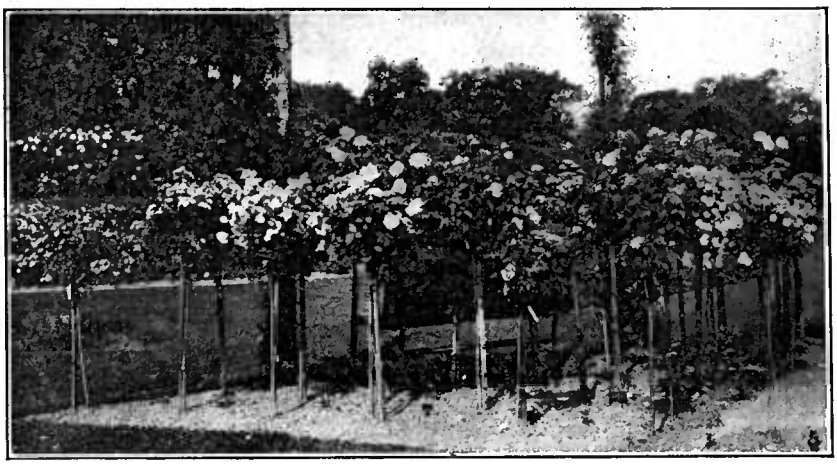
stems into pieces so that each one has some roots and an eye each one will make a plant.

Some rose species, like *Rosa hugonis*, are difficult to grow from cuttings and are therefore grown by layering; that is, by covering shoots with earth until they are well rooted before cutting them from the plant. The rooted stems of the Wichuraiana might be considered to be natural layers.

Climbing roses are mostly propagated by hardwood cuttings. Cut-flower roses are grown from hardwood cuttings, greenwood or softwood cuttings, and by budding or grafting.

Hardwood cuttings are taken from the dormant wood of winter, while softwood, or greenwood, cuttings are taken when the plants are in active growth. To make a hardwood cutting, good, strong,

well-ripened shoots of the past summer's growth should be selected. These are better if cut between the time the leaves fall and freezing weather. If left until after cold weather there is danger of injury from freezing. They should be cut into pieces of 5 or 6 inches, with the upper cut just above a bud, and should be tied in bundles with raffia or with string that does not rot easily if exposed to dampness. After labeling plainly they should be buried in moist sand, tops down, and placed in a cool cellar or buried in the open ground below danger of frost. They should be planted in the open ground in the spring about or a little before corn-planting time, so that one or two eyes, or not over 1 inch of the cutting, is above the ground, which will leave 4 or 5 inches in the ground. Care must be taken not to injure the calluses that have formed while the cuttings were



P 15126HP

FIG. 25.—Tree roses. Not very satisfactory in the climate of the United States.

buried. Sometimes better results are obtained by planting in partial shade.

Frequently cuttings made in winter or early spring do nearly as well as those made in the fall, but in the North there is always danger of the wood being injured during the winter.

Softwood, or greenwood, cuttings (fig. 26) are made soon after blooming, from wood of the current year's growth. This may be taken from the stems that have grown roses or those that have not. There are claims that it makes a difference which sort of shoot is used, but good, strong shoots are the most important consideration. These should be cut to three eyes. All the leaves should be removed except the top one, and all the leaflets should be removed from this except parts of two. These cuttings may or may not be made with a "heel," which in this sense is a piece of older wood at the bottom

of the cutting. The cuttings should be planted at once in light loamy soil or in sand in a bed where the atmosphere may be inclosed. A coldframe or spent hotbed is a suitable place if the glass is shaded or a cheesecloth frame is used instead of the sash. For a few cuttings many people have success by inverting over them a fruit jar (fig. 27) or a glass dish. The cuttings, however, need to be shielded from the direct rays of the sun when under glass, to prevent burning. The object of the inclosed atmosphere is to prevent undue evaporation from the leaves before roots have formed sufficiently to support the plant. When roots have freely formed, the plants should be transplanted to good soil, watered well, and shaded for a few days from the midday sun. Subsequent watering should be moderate until they are well established.

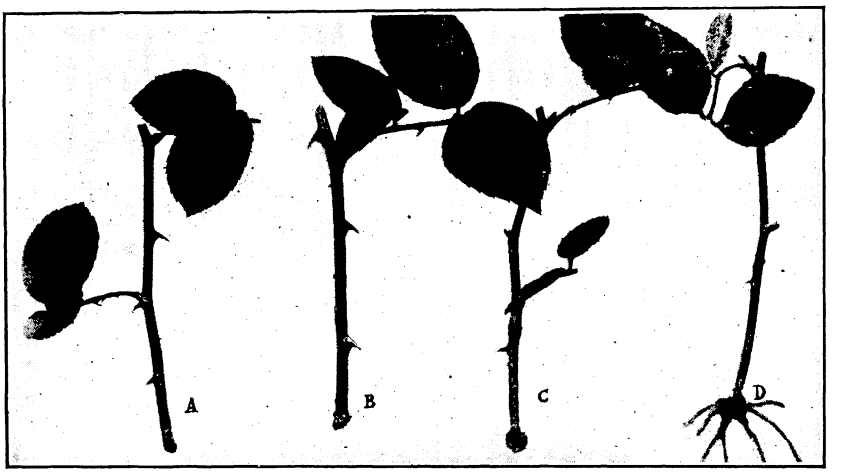


FIG. 26.—Rose cuttings: *A*, First made; *B*, partially callused; *C*, callused; *D*, roots starting.

Budding and grafting are not necessary in order to get satisfactory results in growing roses either about the farm home or on the city lot; therefore, space will not be taken here to describe the methods employed.[1]

INSECT REMEDIES.[2]

Insects which most commonly affect roses are of two general types, those which eat the foliage, as rose slugs and the rose chafer, and those which suck the sap, as aphids, scale insects, and thrips.

[1] For methods of budding and grafting, see U. S. Dept. of Agr., Farmers' Bulletin 157, entitled "The propagation of plants."

[2] The matter relating to insect remedies was reviewed in the Branch of Forest Insects, Bureau of Entomology, which investigates insects affecting hardy shrubs, including roses, to whom inquiries about them should be addressed.

The presence of leaf-eating insects is usually first detected through the discovery of partially eaten leaves or of skeletonized leaves; that is, leaves from which a portion of the lower or upper surface has been eaten, leaving the other surface as a transparent membrane, or leaves the fleshy part of which has been eaten clear through, often leaving merely the midrib and veins. The discovery of the enemy frequently follows. Protection from this sort of attack is afforded by hand picking or by covering both surfaces of the foliage thoroughly with some poisonous substance, as arsenate of lead. Wherever a garden hose is available, a strong stream of water directed against rose slugs on the foliage will knock them off and, in many cases, save the bush from further injury by them. The rose chafer is a rather difficult insect to control, and arsenical poisons applied at double the usual strength often fail to kill them before the damage is done. Frequent hand picking of the beetles and dropping them into a vessel containing water covered with a film of kerosene, or screening the plants with mosquito netting, especially the latter, often affords the only means of preventing their destructive work.[1]

P15000HP

FIG. 27.—Rooting a hardwood rose cutting under a fruit jar. This protection is even more necessary for greenwood than for hardwood cuttings.

Arsenate of lead, the substance usually most available as a spray against leaf-eating insects, is a deadly poison. It is procurable in most seed stores as a white paste, or powder, and should be used at the rate of about one-eighth of a pound of the paste or one-sixteenth of a pound of the powder to 10 quarts of water.

Sucking insects obtain their food by sucking the sap. Aphids are usually on the youngest growth at the tips of the branches, both on the stems and on the under side of the leaves. When badly infested, the leaves curl and protect the insects on their under surface. Thrips injure the flowers, while scale insects usually inhabit the

[1] For fuller information on the habits and control of the rose chafer, see Farmers Bulletin 721.

woody portion of the bush and are capable of killing it. Insects of this class have to be killed by the insecticide coming in contact with them. Materials used for this purpose are 40 per cent nicotine sulphate, pyrethrum, fish-oil soap, kerosene emulsion, and lime-sulphur. The material should be applied in a fine spray, with considerable force, so as to find its way under the foliage and strike the culprit. Death comes from the insecticide closing the breathing pores and suffocating the insect or penetrating to its vital parts, or both. Great thoroughness is needed in applying these insecticides. The aphids may often be knocked off by a strong stream of water from a hose where available, and this treatment, frequently given, is often all that is necessary to keep them in check. An abundance of ants on the plants is always suggestive of the presence of aphids.

Forty per cent nicotine sulphate, a liquid procurable in most seed stores under various proprietary names, diluted with about 1,000 parts of water in which a little fish-oil soap or good laundry soap has been previously dissolved, is now recognized as the most efficient aphid remedy. For small quantities, add 1 teaspoonful of the nicotine to each 1 or 2 gallons of water in which about one-half an ounce of soap has been dissolved. One thorough application is usually 100 per cent effective, though a second spraying may sometimes be necessary. The necessity of covering every individual insect should be constantly borne in mind.

Pyrethrum, known also as buhach or Persian insect powder, may be used at the rate of 1 ounce to 2 quarts of water. This is much more effective when fresh.

Fish-oil soap may be dissolved at the rate of one-fourth of a pound to 8 quarts of water. It dissolves most quickly in hot water. A small quantity of hot water may be used first and then the solution diluted to the quantity mentioned. It should be cooled before it is applied.

Kerosene emulsion may be prepared as follows: Dissolve 1 ounce of good laundry soap in 1 pint of hot water; remove from the fire, add 1 quart of kerosene, and beat until a creamy mixture is formed, from which the oil does not separate, but which becomes semisolid on cooling. To pump it back into itself by means of the spray pump is an efficient method of emulsifying the mixture. This emulsion should be reasonably permanent and may be kept as a stock solution. For applying, use 1 pint of the stock solution to 10 quarts of water.

Commercially prepared insecticides, like lime-sulphur, should be used according to the directions accompanying them. There are many good brands on the market.

DISEASES OF ROSES.

Mrs. Flora W. Patterson, Mycologist of the Bureau of Plant Industry, contributes the following on the subject of the fungous diseases of roses:

Fungous parasites.—Roses are rarely killed outright by fungous parasites, but by their presence the vigor of plants is greatly reduced, the foliage may be rendered unsightly, branches become more or less distorted or disfigured, and the quality of the blossoms lowered. In considering the fungous diseases of these plants the fact must be recognized that in common with similar diseases of other plants treatments are preventive rather than curative. While thorough and repeated sprayings with a suitable fungicide will in most cases so check the development of the parasite that the disease for the growing season will be in a great measure controlled, the full benefit of fungicidal applications can only be secured by their early use in the spring, guarding in this way against the recurrence of a disease of the previous season.

Fungicides to be recommended for rose diseases are Bordeaux mixture, lime-sulphur, potassium sulphid, ammoniacal solution of copper carbonate, and a dust mixture of ground sulphur and arsenate of lead. The lime-sulphur has proved very valuable, as it does not injure the foliage of even delicate tea roses.

Powdery mildew.[1]—Powdery mildew is extremely common, few gardens being entirely free from this most destructive of all rose diseases. Wild as well as cultivated roses suffer from it, crimson ramblers being especially susceptible. There is, however, a wide difference in the susceptibility of different varieties, as well as in the susceptibility of the same variety in different localities. Each rose grower should give special attention to the degrees of resistance shown by the various sorts in his collection, keeping only those which show the greatest resistance to the disease.

The fungus frequently appears very early in the season on young buds, leaves, and young shoots. It causes the appearance of a delicate white mildew that becomes mealy after the development of the conidia, or summer spores.[1] If the attack is severe, the normal development of the succulent young shoots is arrested, the leaves become curled and deformed, falling prematurely, and complete defoliation sometimes results. Later in the season on twigs, calyx, fruit, and even on canes the fungous mycelium[2] forms a whitish, feltlike covering on which minute spherical black bodies are borne and in which the winter spores develop. These spores are capable of persisting through the winter and setting up a new infection in the spring.

The stage of the disease in which the summer spores are produced in immense numbers may be held under control by several treatments with a fungicide applied very thoroughly at intervals of 10 days to a fortnight. Bordeaux mixture or lime-sulphur may be used, but dusting with sulphur arsenate is to be preferred, being generally more effective and rendering the foliage less unsightly than the liquid sprays. If the development of the parasite has not been completely arrested in its summer stage and if the winter spores have been permitted to develop, more energetic measures must be taken. Late in the fall diseased portions of the bushes should be trimmed off and burned, together with all fallen leaves and débris that have collected under the bushes. The plants should then be thoroughly sprayed with Bordeaux mixture, as recommended for dormant plants.

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[1] Microscopic bodies which serve to reproduce the fungus.
[2] Microscopic threadlike growth of the fungus.

1. Sphaerotheca pannosa (Wallr.) Lév.

Rosæ rusts.[1]—The diseases known as rusts are caused by any one of several parasitic fungi, and they occur on both wild and cultivated bushes. Any part of the plant may suffer from the presence of the fungus, but the effect produced varies with the time of year and the part attacked. In the spring or early summer on the green parts of the bush conspicuous orange-colored swellings appear that later in the season take on a deeper shade and become powdery. On the leaves the effect may be shown by small circular spots, but when the swellings occur on young, green stems and petioles, those parts become bent and greatly distorted. During these stages of growth the parasite has borne two kinds of spores, but later a third kind, the winter spores, develop either in small black groups on the under surface of the leaf or in more or less elongated black powdery patches on the woody stems.

The spread of the disease in its early stages can be checked by spraying several times with ammoniacal copper carbonate, but it is advisable first to cut off the infected parts. Late in the autumn all infected material must be cut away and burned and the bush thoroughly sprayed with strong Bordeaux mixture. If the bushes continue to suffer for two or three seasons from rust, they might well be dug up and burned, for the fungus is capable of living over the winter in apparently healthy stems and may be a source of continuous trouble.

Anthracnose.[2]—Anthracnose is caused by a fungus which attacks all parts of the bushes, but the young growth is most susceptible. On the leaves appear blotches that contain the fruiting bodies and later become pinkish from the escaping spores. Upon the surface of the branches similar fruiting bodies form and, bursting, discharge a pinkish mass of spores. These fruiting bodies may entirely surround the branch and spread toward its tip. The leaves upon such a branch are dwarfed and pale and soon fall. The complete defoliation of the bush may follow a severe attack. During the growing season the disease may be fairly well controlled by spraying several times with Bordeaux mixture or ammoniacal copper carbonate. Later, all diseased branches must be rigorously cut back and together with the fallen leaves carefully raked up and burned and the bushes thoroughly treated with Bordeaux mixture, as recommended for dormant plants.

Leaf-spot.—There are several distinct diseases that are called leaf-spots, and each is caused by a different fungus, but the effects of these parasites upon the leaves are very similar, and such attacks are seldom serious. The spots have a more or less brownish center with a purplish border.

The spread of these troubles may be checked by spraying with Bordeaux mixture or the solution of ammoniacal copper carbonate, but it is well also to pick off as many as possible of the spotted leaves and burn them.

Leaf-blotch.[3]—Leaf-blotch, also known as "black-spot," is probably the most common and injurious of all fungous diseases to which the rose is subject except powdery mildew. Many species suffer from it, but certain varieties are immune to the disease, and if it is troublesome in a garden it will be well to cultivate the resistant varieties. Bush roses are more susceptible to this trouble than climbing roses, and attacks are most severe in wet seasons. The first symptoms of the presence of the parasite are irregularly shaped blackish spots without definite borders on the upper surface of mature or nearly full-grown leaves. These spots may grow together so as to cover almost the entire leaf. In this stage the trouble may be controlled by several applications of Bordeaux mixture, lime-sulphur, or sulphur arsenate. As Bordeaux mixture and lime-sulphur discolor the foliage, the sulphur-arsenate dust is to be preferred. If this stage of the fungus is permitted to remain untreated, another spore-producing form develops in the same spots. This second form matures upon fallen leaves, and

1. Phragmidium subcorticium (Schrank) Wint + other species of Phr
2. Gloeosporium rosae Halsted (
3. Actinonema rosae (Lib) Fr. (perfect stage is Diplocarpon rosae Wol

its spores living over the winter are able to set up a new infection in the spring. This fact shows the necessity of raking up and burning the fallen leaves, as well as the advisability of drenching the ground under the bushes both then and in the early spring with strong Bordeaux mixture. It is well to begin the spring treatments with lime-sulphur or sulphur arsenate on plants that have suffered from the preceding season without waiting for an appearance of the disease.

Common canker.[1]—Outdoor roses in many localities suffer severely from two forms of canker not always readily distinguished by the ordinary grower. The early symptoms of a disease long recognized as a common canker are the appearance of small reddish patches on the green parts, generally of 1-year-old growth. The disease is caused by a fungus classed as a wound parasite, that is, the spores gain entrance to the bush through certain mechanical injuries. These may be slight ones made upon the young branches by the thorns of the bush itself when one branch has been blown against another, or by insect punctures. Such infected areas may increase until the entire stem is surrounded and may extend for several inches along the branch. Unfortunately no absolutely certain method of treatment has been worked out, and the only advice to be given is to rigorously cut away all diseased branches, and it may be necessary to cut back entire bushes if badly infected. Cover the exposed surfaces made by this cutting with paint or tar. This diseased material must be burned and the dormant bushes sprayed with strong Bordeaux mixture in both the autumn and early spring. At the first appearance of the disease, cut away and destroy all the branches showing infection. Then spray about every 10 days, first with Bordeaux mixture and later with ammoniacal copper carbonate, as spraying with the latter has no disfiguring effect upon the foliage, an appearance to be avoided when blossoming time is near. It is possible that by such careful attention the bushes may outgrow the disease. But if, after following the treatments recommended, the fungus reappears for several successive seasons, it would be advisable to dig up and burn the bushes, hoping to replace them with some less susceptible variety of roses.

Brown canker.[2]—Brown canker differs from common canker in color and general appearance, diseased areas being brown, often with a purple margin, rather than a dirty gray. The results of measures taken for the control of this disease have as yet not been encouraging, and the drastic step of the entire destruction of the plants may become necessary.

Crown canker.[3]—Crown canker, also caused by a fungus, has become an important disease of greenhouse roses. The first symptoms are usually noted at the surface of the soil, causing a discoloration of the bark which, becoming black and water-soaked, may extend around the stem. Successful attempts for controlling the disease have not been reported.

Crown gall.[4]—Crown gall is a very common disease of roses grown out of doors as well as in the greenhouse. It is a bacterial disease, causing the development of galls or tubercles on various parts of the plants, but generally on the crown or roots. No treatment will cure an affected plant, and the soil in which it was growing should be sterilized before using it again for roses.

FUNGICIDES FOR ROSE DISEASES.[1]

Bordeaux mixture.—Bordeaux mixture is the best all-round fungicide, but it will stain the foliage and other objects with which it comes in contact a blue-

[1] For more detailed information, see U. S. Dept. of Agr., Farmers' Bulletin 243, entitled "Fungicides and their use in preventing diseases of fruits."

1. Coniothyrium
2. Diaporthe umbrina Jenkins
3. Cylindrocladium scoparium
4. Pseudomonas tumefaciens E. F. Smith & Townsend

green color. Wooden or earthen containers should be used in mixing this spray. If metal containers are used, both the containers and the spray may be ruined.

The following formula for Bordeaux mixture is recommended for summer spraying: Copper sulphate (bluestone), 2½ ounces; lime (unslaked), 2½ ounces; water to make 2 gallons.

For spraying dormant plants reduce the quantity of water used in making up the spray from 2 gallons to 1½ gallons.

Mix the copper sulphate with nearly half of the water, being sure that it is thoroughly dissolved. Slake the lime with a little water, to make a smooth paste, then add most of the rest of the water to the paste, making a uniform solution of milk of lime. Pour these two solutions at the same time into a vessel containing the remainder of the water, and, after thoroughly stirring, strain the mixture. If properly made, the mixture will have a sky-blue color, and it should be used promptly. The two solutions, however, may be kept indefinitely before being poured together.

To make the liquid adhere to the plants an ounce of any good mild soap for each gallon of mixture should be dissolved in a little hot water and added to the mixture.

Potassium sulphid.[1]—Potassium sulphid for home use may be made according to the following formula: Potassium sulphid (liver of sulphur), 1 ounce; water, 3 gallons. The addition of 1 ounce of any good mild soap to each gallon of the solution of these ingredients is recommended to make the liquid adhere to the plants.

Lime-sulphur.—Commercial lime-sulphur has directions for its use upon the container and can be purchased from seedsmen and hardware firms handling farm implements, or it may be made at home as for spraying fruit trees. It is one of the best of fungicides, but it discolors the foliage almost as much as Bordeaux mixture. Care must be used in applying it near buildings, as it spots paint badly. It is injurious to the clothing and is caustic in its action on the skin. Cold cream or vaseline used in liberal quantities will serve as a protection.

Ammoniacal copper carbonate.—The ammoniacal spray is difficult to prepare and requires caution in handling and application. It should not be employed unless the discoloration caused by the other sprays is seriously objectionable. Wooden or earthen containers, not metal, should be used in handling it.

The following formula is suggested for making ammoniacal carbonate of copper: Copper carbonate, one-fourth ounce; strong ammonia (26° Baumé), about one-half gill; water, 2 gallons.

Dilute the ammonia with a little of the water and dissolve the copper carbonate in it, using only barely enough ammonia to dissolve the carbonate; if necessary, reserve a little of the carbonate until the rest has been dissolved, and then add the remainder. No more of the ammonia than enough to dissolve the carbonate should be used under any circumstances. The clear blue liquid may then be diluted with the remainder of the water, and, if properly made, it does not become cloudy as it is diluted.

Sulphur arsenate.—The dust mixture known as sulphur arsenate is a combination of 90 parts of finely ground sulphur and 10 parts of powdered arsenate of lead. It should be thoroughly applied with a hand duster.[2]

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[1] Metal containers should not be used in mixing this spray.

[2] A suitable dusting device for the use of powdered fungicides can be purchased from dealers in agricultural implements at prices varying from 74 cents to $3.

SPRAYING.

To make effective application of the remedies for the control of insects and diseases, the materials must be applied to all parts of the plant. This is best done by the use of a fine spray applied till the foliage is wet, but not so wet that the liquid collects into drops.

To do good work, it is not only necessary to use a pump that has power sufficient to produce a very fine spray, but the nozzle needs to be connected with the tank by a hose, so that it may be turned in any direction, and the outlet should be at an angle of 90° to the supporting tube, so as to facilitate throwing the spray on the under side of the leaves as well as on top. This is necessary because many insects and diseases attack from below as well as from above. In order to meet these conditions a very large or expensive outfit is not essential, but the capacity of the nozzle should be adjusted to the power of the pump. For a few roses, a gloved thumb and finger to crush the attacking insects, a coarse cotton bag to apply dry powders, and a pair of scissors to clip off diseased leaves on their first appearance, will produce satisfactory results with a real rosarian, that is, with one who so loves roses that he almost unconsciously inspects them several times a day. Anyone living on a place large enough to require the use of a shovel and hoe should have a 3-gallon or 5-gallon spray outfit, whether he has any roses or not, as there are but few plants grown that do not need the insurance afforded by the judicious use of such an implement.

SUMMARY.

Roses may be divided into classes according to the purposes for which they are used, as for lawns and borders, for arbors or trellises, for cut flowers, and for other ornamental purposes.

Native species and those least modified by man's crossing and selection are most suitable for lawn and border planting.

Climbing roses used for arbors and trellises may be handled either to give an abundance of bloom or to produce shade, but they can not do both satisfactorily, and they are not as well adapted to the production of shade as many other plants.

Cut-flower roses need clean culture, severe pruning, and special care; therefore, they should be planted by themselves in secluded beds and should not be used to beautify the grounds in place of the roses appropriate for lawns and borders.

Roses are not very satisfactory for hedges.

The Wichuraiana rose is useful as a ground cover.

Tree roses are not satisfactory, except in the Pacific Northwest.

The essentials for successful growth are a well-drained retentive soil thoroughly enriched, preferably with rotted manure. Cut-flower roses especially need heavy annual manuring.

Special care must be exercised to prevent the roots from drying when out of the ground for transplanting.

Own-rooted plants are best for the average grower.

Cut-flower roses need protection near the northern limits of the successful cultivation of the variety.

Dormant roses should have one-half to two-thirds of the wood removed at the time of transplanting.

Border roses should have little pruning, the removal of the dead wood and the cutting of the whole bush to the ground every 5 to 8 years being best for most varieties.

Climbing roses should be pruned just after blooming by having the wood of the previous year's growth removed.

Cut-flower roses should be cut each spring to within 6 inches or 1 foot of the ground for finest blooms, or one-third to one-half the wood should be left for the greatest quantity of bloom.

Watchfulness is the price of success with roses, especially with the climbing and the cut-flower varieties.

Advice as to varieties for a particular region is best obtained from the nearest grower or nurseryman.

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